

WHAT IS CLAIMED IS:

1. A pixel signal processing apparatus for processing pixel signals from pixels arrayed in a two-dimensional plane, each pixel having a different one of N spectral characteristics, to generate an interpolated pixel signal having a k-th spectral characteristic at a pixel interpolation position occupied by a pixel having an h-th spectral characteristic, where h and k are positive integers between 1 and N, inclusive, the pixel signal processing apparatus comprising:

a difference calculation means for calculating a difference between a low-frequency component of pixel signals having the k-th spectral characteristic in a plurality of pixel positions in a neighborhood of the pixel interpolation position and a low-frequency component of pixel signals having the h-th spectral characteristic in a plurality of pixel positions in the neighborhood of the pixel interpolation position;

a non-correlation value calculating means for calculating a non-correlation value corresponding to a degree of non-correlation between the pixel signals having the k-th spectral characteristic and the pixel signals having the h-th spectral characteristic in the neighborhood of the pixel interpolation position; and

an interpolated value calculating means for obtaining the pixel signal having the k-th spectral characteristic at the pixel interpolation position from the pixel signal having the h-th spectral characteristic at the pixel interpolation position, the difference, and the non-correlation value.

2. The pixel signal processing apparatus of claim 1, wherein the interpolated value calculating means obtains the pixel signal having the k-th spectral characteristic at the

pixel interpolation position by adding the pixel signal having the h-th spectral characteristic at the pixel interpolation position, a product of the non-correlation value and a first prescribed coefficient, and a product of the difference and a second prescribed coefficient.

3. The pixel signal processing apparatus of claim 1, wherein the difference calculation means comprises:

a plurality of low-pass filters for generating low-frequency components of the pixel signals having the N spectral characteristics;

a selecting means for selecting the low-frequency component of the pixel signal having the k-th spectral characteristic and the low-frequency component of the pixel signal having the h-th spectral characteristic from the low-frequency components output from the plurality of low-pass filters; and

a difference calculating means for calculating the difference between the low-frequency component of the pixel signals having the k-th spectral characteristic and the low-frequency component of the pixel signals having the h-th spectral characteristic.

4. A pixel signal processing apparatus for processing pixel signals from pixels arrayed in a two-dimensional plane, each pixel having a different one of N spectral characteristics, to generate an interpolated pixel signal having a k-th spectral characteristic at a pixel interpolation position occupied by a pixel having an h-th spectral characteristic, where h and k are integers between 1 and N, inclusive, the pixel signal processing apparatus comprising:

a ratio calculation means for calculating a ratio of a low-frequency component of pixel signals having the k-th

spectral characteristic in a plurality of pixel positions in a neighborhood of the pixel interpolation position to a low-frequency component of pixel signals having the h-th spectral characteristic in a plurality of pixel positions in the neighborhood of the pixel interpolation position;

a non-correlation value calculating means for calculating a non-correlation value corresponding to a degree of non-correlation between the pixel signals having the k-th spectral characteristic and the pixel signals having the h-th spectral characteristic in the neighborhood of the pixel interpolation position; and

an interpolated value calculating means for obtaining the pixel signal having the k-th spectral characteristic at the pixel interpolation position from the pixel signal having the h-th spectral characteristic at the pixel interpolation position, the calculated ratio, and the non-correlation value, wherein:

the pixel signal having the k-th spectral characteristic at the pixel interpolation position is obtained by multiplying the sum of the pixel signal having the h-th spectral characteristic at the pixel interpolation position and the product of the non-correlation value and a first prescribed coefficient by the product of the calculated ratio and a second prescribed coefficient.

5. The pixel signal processing apparatus of claim 1, wherein the non-correlation calculating means comprises:

a varying component generating means for generating a varying component of the pixel signals having the k-th spectral characteristic in the neighborhood of the pixel interpolation position and a varying component of the pixel signals having the h-th spectral characteristic in the neighborhood of the pixel interpolation position; and

a difference calculating means for calculating, as the

non-correlation value, a difference between the varying component of the pixel signals having the k-th spectral characteristic and the varying component of the pixel signals having the h-th spectral characteristic generated in the varying component generating means.

6. A pixel signal processing method for processing pixel signals from pixels arrayed in a two-dimensional plane, each pixel having a different one of N spectral characteristics, to generate an interpolated pixel signal having a k-th spectral characteristic at a pixel interpolation position occupied by a pixel having an h-th spectral characteristic, where h and k are integers between 1 and N, inclusive, the pixel signal processing method comprising:

a difference calculation step for calculating a difference between a low-frequency component of pixel signals having the k-th spectral characteristic in a plurality of pixel positions in a neighborhood of the pixel interpolation position and a low-frequency component of pixel signals having the h-th spectral characteristic in a plurality of pixel positions in the neighborhood of the pixel interpolation position;

a non-correlation value calculating step for calculating a non-correlation value corresponding to a degree of non-correlation between the pixel signals having the k-th spectral characteristic and the pixel signal having the h-th spectral characteristic in the neighborhood of the pixel interpolation position; and

an interpolated value calculating step for obtaining the pixel signal having the k-th spectral characteristic at the pixel interpolation position from the pixel signal having the h-th spectral characteristic at the pixel interpolation position, the difference, and the non-correlation value.

7. The pixel signal processing method of claim 6, wherein the interpolated value calculating step obtains the pixel signal having the k-th spectral characteristic at the pixel interpolation position by adding the pixel signal having the h-th spectral characteristic at the pixel interpolation position, a product of the non-correlation value and a first prescribed coefficient, and a product of the difference and a second prescribed coefficient.

8. The pixel signal processing method of claim 6, wherein the difference calculation step comprises:

a low-pass filtering step for generating low-frequency components of the pixel signals having N spectral characteristics;

a selecting step for selecting the low-frequency component of the pixel signal having the k-th spectral characteristic and the low-frequency component of the pixel signal having h-th spectral characteristic from the low-frequency components obtained by filtering in the low-pass filtering step; and

a difference calculating step for calculating the difference between the low-frequency component of the pixel signals having k-th spectral characteristic and the low-frequency component of the pixel signals having the h-th spectral characteristic, selected in the selecting step.

9. A pixel signal processing method for processing pixel signals from pixels arrayed in a two-dimensional plane, each pixel having a different one of N spectral characteristics, to generate an interpolated pixel signal having a k-th spectral characteristic at a pixel interpolation position occupied by a pixel having an h-th spectral characteristic, where h and k are integers between 1 and N, inclusive, the pixel signal processing method comprising:

a ratio calculation step for calculating a ratio of a low-frequency component of pixel signals having the k-th spectral characteristic in a plurality of pixel positions in a neighborhood of the pixel interpolation position to a low-frequency component of pixel signals having the h-th spectral characteristic in a plurality of pixel positions in the neighborhood of the pixel interpolation position;

a non-correlation value calculating step for calculating a non-correlation value corresponding to a degree of non-correlation between the pixel signals having the k-th spectral characteristic and the pixel signals having the h-th spectral characteristic in the neighborhood of the pixel interpolation position; and

an interpolated value calculating step for obtaining the pixel signal having the k-th spectral characteristic at the pixel interpolation position from the pixel signal having the h-th spectral characteristic at the pixel interpolation position, the calculated ratio, and the non-correlation value, wherein:

the pixel signal having the k-th spectral characteristic at the pixel interpolation position is obtained by multiplying the sum of the pixel signal having the h-th spectral characteristic at the pixel interpolation position and the product of the non-correlation value and a first prescribed coefficient by the product of the calculated ratio and a second prescribed coefficient.

10. The pixel signal processing method of claim 6, wherein the non-correlation value calculating step comprises:

a varying component generating step for generating a varying component of the pixel signals having the k-th spectral characteristic in the neighborhood of the pixel interpolation position and a varying component of the pixel signals having the h-th spectral characteristic in the

neighborhood of the pixel interpolation position; and
a difference calculating step for calculating, as the
non-correlation value, a difference between the varying
component of the pixel signals having the k-th spectral
characteristic and the varying component of the pixel signals
having the h-th spectral characteristic generated in the
varying component generating step.